

water Fig. 3 is produced, but more delicate and more regular than that obtained with litmus.

Azure Blue.—The aqueous and alcoholic solutions of azure-blue or pearl form figures similar to those already described. In acidulated water we obtain a very regular spheroidal nucleus of a very dark blue, surrounded by a spheroidal layer with an inferior stem (No. 6).

Cochineal.—The aqueous solution forms in acidulated water the figure No. 3, regular, like that of litmus and of lake. In salt water, cochineal, not being soluble, is precipitated and the phenomenon is not produced.

Iodine.—The alcoholic tincture of iodine forms, in sugared, salt, or acidulated water, beautiful figures almost identical with those of the colours of the aniline solution.

Bichromate of Potash.—To make the experiments with bichromate of potash succeed I changed the arrangement of the experiment on account of the very great density of the solution in comparison with the density of water. I fill the vessel in the usual manner, then I place above the vessel a small funnel, fitted with a capillary tube which partly enters the liquid. The aqueous solution of bichromate of potash being poured into the small funnel, flows out, forming a small descending spiral, which usually is arrested in the division between the more and less dense parts of the liquid. In acidulated or salt water two very beautiful figures are formed resembling those of Nos. 2 and 5, but reversed.

The various experiments described above have been repeated several times for each colour, and I have always obtained the same results. This persistence of form shows that the phenomenon is regulated by a law which I shall seek to discover. I believe I may conclude from these first attempts that the form of the figure depends on the liquid in which the colour is dissolved, more than on the colour itself. By employing other acids and other salts, not such, however, as precipitate the colour, it is probable that other figures would be obtained.

TRACES OF EARLY MAN IN JAPAN

SO much interest is felt in the origin of the Japanese, that any information regarding earlier races in Japan will interest the readers of NATURE.

The discovery and examination of a genuine kjoekkenmoedding, or shell heap, enables me to give positive evidences regarding a prehistoric race who occupied this island. Whether autochthonous or not it would of course be impossible to say. On my first ride to Tokio, in June of this year, I observed, from the car window, near a station called Omori, a fine section of a shell heap, which was recognised as such at once, from its resemblance to those I had often studied along the coast of New England. On September 16, accompanied by Messrs. Matsumura, Matsura, and Sasaki, three intelligent Japanese students, I made an examination of it, and a few days afterwards, in company with Dr. David Murray, Superintendent of Public Instruction, and Mr. Vukuyo, with two coolies to do the heavy digging, made an exhaustive exploration of it.

The deposit is composed of shells of various genera, such as *Vusus*, *Eburna*, *Turbo*, *Pyruia*, *Arca*, *Pecten*, *Cardium*, two strongly marked species of *Ostrea*, and curiously enough, *Mya arenaria*, not to be distinguished from the New England form, as well as other genera. These shells, so far as I know, still live in the Bay of Yedo. The heap is about 200 feet wide, and varies from a foot to five or six feet in thickness, with a deposit of earth above, at least three feet in thickness. It is now nearly half a mile from the shore of the Bay, though in accordance with the usual position of these heaps in other parts of the world, it must have been formed near the shore, and this fact indicates a considerable elevation of the land since the deposits were made. I may add that other

evidences of a geological nature indicate a wide-spread upheaval in past times.

The peculiarities of the typical shell-heap, such as fragments of bones, rough implements worked out of horn, and pieces of pottery, are all here. The heap, however, is marked by certain features which render it peculiar.

First, the immense quantity of pottery and its diversity of ornamentation, some of it extremely ornate, but very rude.

Second, the absence of bone-implements, the few found—eight or ten in number—being of horn, with the exception of an arrow-head of diminutive proportions, made of the tusk of a wild boar. All the implements are very simple; two of them are like blunt bone awls, with the end very obtuse, and a constriction worked around the end. Another one is made from the natural termination of a deer's antler. A few fragments of horn were found which had been cut off at the ends.

Third, the entire absence of flint flakes, or stone implements of any kind, if we except a small stone adze found near the top of the heap, and made out of a soft sandstone. The frequent occurrence of isolated tusks of the wild boar would seem to indicate that these teeth were used for implements, and one piece of antler, having a hole in the end, is worked in the form of a rude handle. By far the most common bones found were those of the deer and wild boar, and curiously enough Steenstrup shows the same proportion in the Danish shell heaps. No human bones have yet been found.

An analysis of the red pigment found on some of the pottery shows it to be cinnabar. With its removal from the shore, its elevation above the level of the sea, the absence of stone implements, and the great thickness of the earth deposits above, we have reasons for believing that the deposit is of high antiquity.

Through the intelligent interest manifested by Mr. Kato and Mr. Hamao, Director and Vice-Director of the Imperial University of Tokio, every facility for a thorough investigation of these deposits will be given me.

Tokio, Japan, September 21 EDWARD S. MORSE

NOTES

It is proposed to hold the next annual meeting of the Association for the Improvement of Geometrical Teaching (under the presidency of Dr. Hirst) at University College, Gower Street, on January 11, 1878, at 10.30 A.M. Four resolutions are to be submitted to the Association:—1. That in the opinion of this Association it is both reasonable and expedient that candidates at all examinations in elementary geometry should be required to give evidence of such ability as is necessary for the solving of easy geometrical exercises; and that the secretaries of the Association be instructed to send a copy of this resolution to the leading examining bodies of the country. The other resolutions relate to the proposed formation of sub-committees for drawing up a syllabus of (1) Solid Geometry, (2) Higher Plane Geometry (Transversals, Projection, &c.), (3) Geometrical Conics. It may be in the recollection of our readers that the report of the British Association Committee (in 1876, published at the time in NATURE) was highly favourable to the work of this Association.

THE dissection of the Berlin gorilla was performed last week by Prof. Virchow and Prof. Hartmann in the presence of several prominent Berlin physicians, and it was ascertained that the sudden death of the animal was caused by acute inflammation of the bowels, the same disease which carries off young children so rapidly. The dissection explains the cause of his previous illnesses and supplies valuable information with regard to the treatment of anthropoidal apes. The button of a glove, iron wire, and pins were found in Pongo's stomach.

DURING the past week the Emperor of Germany received a deputation of the members of the German Expedition for observing the transit of Venus, who presented him with a handsomely-mounted album containing copies of all the photographs taken during the transit.

BERN celebrates on December 12 the 100th anniversary of the death of its famous citizen, Albert Haller, who was equally renowned as physiologist, botanist, and poet.

THE *New York Nation* informs us that news has been received of the death of the Rev. James Orton, professor of natural history at Vassar College, and well known as the author of "Comparative Zoology" and "The Andes and the Amazons." Prof. Orton made his first expedition to South America in 1867, crossing the Andes eastward from Peru, and descending the Napo to the Marañon. His second expedition in 1873 was the reverse of the former one, beginning with the ascent of the Amazon. He was on his way home from a third expedition when he died, September 25, on board a small schooner on Lake Titicaca. He was greatly esteemed by all who knew him.

THE *New York Tribune* states that Mr. Edison, the inventor of many improvements in telegraphy, is hard at work in the endeavour to make the telephone record the sounds it transmits. His apparatus at present consists chiefly of a steel point attached to the disk of a telephone and pressing lightly on a strip of paper passed beneath the point at a uniform rate. The vibrations of the disk are thus recorded, and can be translated. Mr. Edison has already achieved some success in this attempt, but as yet finds difficulty with the more delicate vibrations. The invention suggests an ultimate possibility of recording a speech at a distance, verbatim, without the need of shorthand.

NOT one of the designs sent in in competition for the monument to Spinoza at the Hague has satisfied the judges. A new term for receiving designs will therefore be fixed.

ANOTHER letter from Mr. Stanley appears in the *Telegraph* of Thursday last, in which he gives many interesting details of his journey down the Lualaba-Congo, but does not add essentially to what we already know from previous letters. It will be well at present to rest satisfied with the fact that he has solved a great geographical problem; discussion will be appropriate and to some purpose when we are in possession of the full details. In the December number of Petermann's *Mittheilungen* that keen geographer discusses the bearings of Stanley's discovery, and on the basis of the earlier letters identifies the Lualaba-Congo with the discoveries of Browne, Barth, Nachtigal, and Schweinfurth; but on the map which accompanies the paper he carries the great river north to about 4° N. lat. In a postscript on Stanley's own map Dr. Petermann seems to think that his identifications may require modification. Dr. Petermann cannot find terms strong enough in which to speak of the merit of Stanley's work. He calls him "the Bismarck of African exploration," who has united the *dissecta membra* of previous explorations as Bismarck has made one great empire out of a number of isolated states. He is evidently inclined to place Stanley alongside of Columbus.

THE December number of Petermann's *Mittheilungen* contains a long paper on the Iquique earthquake of May 9 last, in which much valuable data are given on the earthquake and on the wave which was simultaneous with it over so wide a stretch of the Pacific Ocean.

THE *Daily News* correspondent at Rome writes that no news has arrived there as to the death of the African explorer, the Marquess Antinori, the inference being that he is still alive. A long letter has been received by the Italian Geographical Society from Signor Matteucci who, with Signor Gessi, is bound for Inner Africa; the two expect to be in Khartoum in the

beginning of December. They were splendidly equipped before leaving Italy.

DR. SCHWEINFURTH, the celebrated African traveller, who has been staying at Berlin since the beginning of August, will shortly return to Africa, as he finds that the European climate no longer agrees with his health. At present he has left Berlin for Weimar.

AT the Geographical Society, on Monday night, Commander Musters, R.N., read a paper on Bolivia, in which he gave much valuable information about a country, its products and its people, about which we are extremely ignorant. Commander Musters lived in the country for a considerable time. Mr. Clements R. Markham read a paper on the still unexplored parts of South America. The fact is we are almost as ignorant of Central South America as, until recently, we were of Central Africa, and there is here a practically virgin field for a second Stanley, if not indeed for Stanley himself.

In a recent number we referred to the preparations which are being made for Prof. Nordenskjöld's expedition to the Arctic regions next summer. The *Handels och Sjöfarts Tidning* of Gothenburg publishes further details, giving the plan of the expedition as presented to the King of Sweden by Prof. Nordenskjöld. We now learn that the steamer *Vega* is being fitted up at the royal wharves of Carlskrona, and will take provisions for two years. The Professor intends to leave at the beginning of July next, and his staff will consist of four scientific men besides himself, four Norwegian sailors who are well acquainted with the Arctic Sea, a ship's officer, eighteen marines, and a ship's doctor. The first halt will be made at the mouth of the Yenisei River; then the expedition will proceed to Cape Tscheljuskin, and try to penetrate as far as possible in a north-easterly direction.

MR. G. J. HINDE, of Toronto, Canada, writes us that a shock of earthquake, unusually severe for that part of the world, occurred along the valleys of the St. Lawrence and Ottawa Rivers, Lakes Champlain and St. George, and through New Hampshire, Vermont, and Western Massachusetts, at or near 2 A.M. of Sunday, the 4th instant. The limits along which it has been noticed are Pembroke on the Upper Ottawa to the north-west, Montreal on the east, Boston and Providence to the south-east, and Toronto to the west. The shock appears to have been most severe on the line of the Ottawa valley between Pembroke and Montreal, and between Ottawa city and Cape Vincent on the St. Lawrence, following in a general direction the outcrops of the Laurentian range. It was but very slightly felt at Toronto, but at Montreal the shocks are stated to have lasted twenty seconds, and to have shaken movable articles about the rooms.

THE following grants in aid of researches have been made this year by the Committee of Council on the report of the Scientific Grants' Committee of the British Medical Association:—Mr. Gaskell, in aid of a research on the reflex action of the vascular system and muscles and reflex vasomotor action generally, 30*l.*; Mr. Langley, in aid of a research on the changes produced in the salivary glands by nerve influence, 25*l.*; Dr. Rutherford, F.R.S., for a continued research on the action of Chologogues, 50*l.*; Drs. Braidwood and Vacher, for engravings for illustrating the third report on the life history of contagium, 40*l.*; Mr. Pye in aid of a continued research for the investigation of the relation that the retinal circulation bears to that of the brain, 8*l.* 15*s.*; Mr. Bruce Clarke, in aid of a continued research on syncope and shock, 10*l.*; Mr. A. S. Lee, Heidelberg, in aid of a research on the quantitative determination of digestive products obtained by the action of pancreatic ferment upon the various albumens, 25*l.*; Dr. McKendrick, Glasgow, in aid of a continued research into the antagonism of drugs, 30*l.*; Dr. McKendrick, Glasgow, in aid of an investigation into the dialysis of

blood (renewed), 10% ; Dr. John Barlow, Muirhead Demonstrator of Physiology, Glasgow, in aid of an experimental investigation into the changes produced in the blood-vessels by alcohol, 10% ; Dr. Joseph Coats, Dr. McKendrick, and Mr. Ramsay, the committee upon the investigation of anæsthetics, 50% ; Dr. McKenzie, a research on pyæmia, 25% ; Mr. Callender, F.R.S., Dr. J. Burdon Sanderson, F.R.S., Dr. T. Lauder Brunton, F.R.S., and Mr. Ernest Hart, the committee appointed for the investigation of the pathology and treatment of hydrophobia, 100%. Total, 413%. 15s.

TELEGRAPH warnings are to be employed all over Paris for giving alarms of fires to all the fire-engine stations. The alarm is given by breaking a small pane of glass facing the streets, being a variation of the system employed on railways for signalling the engine-driver or guard.

IN the November session of the Berlin Geographical Society, Baron v. Richthofen was re-elected president. The evening was chiefly occupied by an address from Dr. Nachtigal, on the results of Stanley's lately accomplished expedition, which he regarded as the most prominent event among later African explorations. Prof. Orth gave a short description of a new method of cartography.

LIEUT. DE SEMELLÉ has intimated to the Paris Geographical Society that he intends to cross Africa from west to east, ascending the Niger and Binué, making for Lakes Albert and Victoria, and reaching the east coast at Mombasa or Malinda. He states that he has already obtained sufficient resources.

THE chemists of Berlin have been occupied lately in analysing the wares of the wine merchants, and no little excitement has been caused by the discovery that the entire stock of one of the largest houses dealing in wines for medicinal purposes, consisted entirely of artificially prepared mixtures of spirit and sugar solutions, flavoured with various herbs.

AT Leipzig a "General German Anti-Adulteration Society" has been formed, which has for its main object the prevention of the adulteration of food. A periodical is to appear, or has already appeared, as the organ of this society. At some fifty other German towns branch societies are being established. All political or religious matters are excluded from the programme of the society, while one of its statutes prescribes the special prosecution of the makers and sellers of so-called secret remedies and medicines.

IN evidence of the interest now being taken by Spain in scientific subjects we may draw attention to the *Boletín de la Institución libre de Enseñanza* (Madrid, 1877), the first five numbers of which, from March 7 to June 17, now lie before us. We notice *Geometría y morfología natural*, Prof. De Linares ; *Investigación de los propiedades ópticas*, Prof. Calderon ; *La religión de los Celtas españoles*, Prof. Costa ; *Principios y Definiciones de la Geometría*, Prof. Jimenez ; *Precipitación de los metales puros por los sulfuros naturales*, Prof. Quiroga. There are accounts of papers read at meetings under the headings "Resúmenes de Enseñanzas," and "Conferencias." The *Boletín* is in shape not quite so large as NATURE, and each number contains four pages.

THE Minister of Instruction in the cabinet chosen by Marshal MacMahon last week is M. A. E. A. Faye, the well-known astronomer, who is spoken of as Leverrier's probable successor. M. Faye is at present in his sixty-third year, and is chiefly known through his discovery of the comet named after him, in 1843. Since that time he has devoted his attention principally to the consideration of the problems of physical astronomy, the solar constitution, &c. His most important works are "*Leçons de Cosmographie*," 1852 ; and a translation of Humboldt's "*Cosmos*." M. Faye is probably the best known in what is

ironically termed the *cabinet des inconnus*. French politics allure an unusually large number of scientific men. Naquet, the chemist, is now a leader of the radical wing of the Republican party, Dumas and Scheurer-Kestner are life members of the senate, and Wurtz was proposed as a candidate for the senate a few weeks since.

THE communication of the city of Moscow with the river Volga, leaving the railway out of account, was, up to the present, only possible in the spring of each year, on account of the shallowness of the Moskwa River. The boats were drawn by horses from Moscow to Kolomna on the river Oka, which falls into the Volga at Nishni-Novgorod, and this means of communication, on account of the great time it occupied, not to mention its cost, was a very imperfect one. A series of locks has recently been constructed on the Moskwa River, and tug steamers are now running between the capital and the Oka.

WE have already referred to the proposed introduction of the telephone into the German telegraphic service. Dr. Stephan, the enterprising Postmaster-General of the German empire, who has brought the German postal service to such efficiency, and fairly created the present international telegraphic system, appears to have definitely settled the question of the practicability of the general introduction of the new method. For the past few weeks the telephone has been in constant use between the General Post Office and the General Telegraph Office in Berlin, and has superseded the telegraphic communication between Berlin and some of the neighbouring villages. The results have been so satisfactory that a few days since a consultation of leading telegraphic officials was held to make arrangements for the establishment of a large number of telephonic stations. Since the equipment of these stations is so inexpensive, and the long and costly preliminary training of a telegrapher is avoided, it can easily be understood with what readiness the new invention is put into practical use. Interesting in this connection is the recent adoption of the telephone by Prince Bismarck. He has caused, as we stated last week, the establishment of a telephonic means of communication between the Chancellor's office in Berlin and his country residence at Varzin, in Pomerania, 230 miles distant ; and finds that he is perfectly able to give instructions and receive reports without leaving his favourite castle. No subterranean wires, but the ordinary telegraphic wires on poles, are used for this purpose.

A SERIES of researches on the compressibility of liquids has recently been described by M. Amagat in the *Annales de Chimie et de Physique*. Among other results, the compressibility is found to be far from depending on the volatility of liquids, as might be supposed. The presence of sulphur, chlorine, bromine, and probably also iodine, tends to diminish the compressibility (a fact sufficiently explained by the corresponding increase of density). With regard to alcohols, the compressibility diminishes from the first member of the series, methylic alcohol, at least at 100°. At 14° common and methylic alcohol have nearly the same compressibility ; and at zero the common alcohol is perhaps more compressible than methylic alcohol. Of the ethers, ethyl-acetic ether is more compressible at 14° and at 100° than methyl-acetic ether (an inverse order to that of the densities, which decrease as you rise in the series. With regard to hydrocarbons, the compressibility decreases regularly both at ordinary temperature and at 100° as you descend in the series.

A MICROSCOPICAL study has recently been made by M. Prilieux, of a disease of fruits, and especially of pears, which consists in the appearance of spots, then of crevices, issuing in complete disorganisation. From the facts described, it appears that the cause of this evil is a fungus, the spores of which are developed on the skin of the fruit with the appearance of a thin filament. At a certain time this filament penetrates the epider-

mis and produces a mycelium, which develops in the very mass of the fleshy tissue. Later there appear, in addition, fructiferous filaments, which bear about twenty-five spores each. The cells of the fruit, on passage of the parasite, are destroyed, and it is thus that the crevices are formed.

THE diffusion which takes place between two gases separated from each other by an absorbent film (e.g., a soap film) was studied a short time ago by Prof. Exner, of the Vienna Academy. He has recently extended his inquiry to the case of vapours from easily volatile liquids, using the same apparatus as for permanent gases. The experiments were made with sulphide of carbon, chloroform, sulphuric ether, benzine, alcohol, and oil of turpentine, and they show that the diffusion from such vapours follows the same laws as those of gases, i.e., that it depends both on the coefficient of absorption of the film and on the density of the gas being directly proportional to the former, and inversely proportional to the square root of the latter. Thus it appears that the greater or less distance of a gas from its liquefaction point has at least no influence on this kind of diffusion.

It is reported that Herr Josef Albert, the eminent Munich photographer, has made the highly important invention of photographing the natural colours of objects by means of a combination of the ordinary photographic process with a photographic printing press constructed by the same gentleman some time ago. The images are stated to be so perfect that not the least improvement with the brush is required, as the finest shades of colours are faithfully reproduced. The secret of the invention is said to be based on the separation of white light into yellow, blue, and red rays, and in the artificial application of the same colours in the printing press. The first negative is taken upon a plate which is chemically prepared in such a manner that it only receives the yellow tints or shades of the object; this is then passed through the printing press, the roller of which is impregnated with a yellow colouring matter. On the print only the yellow tints reappear more or less distinctly; the object is then again photographed, and this time a negative is prepared, which only receives the blue shades and tints; a second printing press has its roller impregnated with some blue colour, and the plate of course gives a print with only the blue tints reproduced. In the same manner a third print is obtained which only shows the red shades and tints. The final manipulation now consists in printing the three images upon the same plate, when the three colours intermingle and the natural colours and shades of the objects are obtained. We need hardly point out the enormous importance of this invention.

A PAMPHLET just published by the Director of the Paris National Library contains some interesting statistical data respecting one of the finest libraries in the world. It has been found that the library contains 86,774 volumes on catholic theology, 44,692 volumes on the science of languages, 289,402 volumes on law, 68,483 volumes on medicine, 441,836 volumes on French history, and 155,672 volumes of poetry. The works on natural science are not yet catalogued. During 1876 the library received no less than 45,300 French additions and purchased 4,565 foreign books.

THE additions to the Zoological Society's Gardens during the past week include two Black-eared Marmosets (*Hapale penicillata*) from South America, presented by Miss Quain; a Black-backed Jackal (*Canis mesomelas*) from South Africa, presented by Capt. Fulton, s.s. *Taymouth Castle*; a Common Boa (*Boa constrictor*) from South America, presented by Miss Alice Leith; a Brown Tree Kangaroo (*Dendrolagus inustus*) from New Guinea, a Slow Loris (*Nycticebus tardigradus*) from Malacca, a River Jack Viper (*Vipera rhinoceros*) from West Africa, purchased; a Green Monkey (*Cercopithecus callitrichus*) from West Africa, deposited.

THE LIBERTY OF SCIENCE IN THE MODERN STATE¹

II.

IT is easy to say: "A cell consists of small particles, and these we call plastidules; plastidules, however, are composed of carbon, hydrogen, oxygen, and nitrogen, and are endowed with a special soul; this soul is the product or the sum of the forces which the chemical atoms possess." Indeed this is possible; I cannot judge of it exactly. This is one of those points which are yet unapproachable for me; I feel there like a navigator who gets upon a shallow, the extent of which he cannot guess. But yet I must say that before the properties of carbon, hydrogen, oxygen, and nitrogen are defined to me in such a manner that I can understand how, through their combination a soul results, I cannot admit that we are justified in introducing the plastidule soul into the educational programme or to ask generally of every educated man that he should recognise it as a scientific truth to such a degree as to operate with it logically, and to base his conception of the universe upon it. This we may really not ask. On the contrary, I think that before we designate such theses as the expression of science, before we say this is modern science, we ought first of all to complete a whole series of lengthy investigations. *We must therefore say to the schoolmasters, do not teach this.* This, gentlemen, is the resignation which in my opinion, those ought to exercise who deem such a solution in itself to be the probable end of scientific investigation. We can certainly not differ on that point for a moment, that if this doctrine of the soul were really true it could only be confirmed by a long series of scientific investigations.

There is a series of events in the field of the natural sciences, by which we can show, for how long certain problems are in suspense, before it is possible to find their true solution. If this solution is found at last, and found in a direction of which there was a presentiment perhaps centuries ago, it does not follow that during those times which were occupied only by speculation or presentiment the problem might have been taught as a scientific fact.

Prof. Klebs spoke of *contagium animatum* the other day, i.e. the idea that in diseases the transmission takes place by means of living organisms, and that these organisms are the causes of contagious diseases. The doctrine of *contagium animatum* loses itself in the obscurity of the middle ages. We have had this name handed down to us by our forefathers, and it is very prominent in the sixteenth century. Certain works of that period exist, which put down *contagium animatum* as a scientific dogma with the same confidence, with the same kind of justification, as nowadays the plastidule soul is set up. Nevertheless the living causes of diseases could not be found for a long time. The sixteenth century could not find them, nor could the seventeenth and the eighteenth. In the nineteenth century we have begun to find some *contagia animata* bit by bit. Zoology and botany have both contributed to them; we have found animals and plants which represent contagia, and a special part of the knowledge of contagia has been absorbed into zoology and botany, quite in the sense of the theories of the sixteenth century. But you will already have seen from the address of Prof. Klebs that the end of proofs has not yet ended. However much we may be disposed to admit the general validity of the old doctrine, now that a series of new living contagia have been found, now that we know cattle disease and diphtheria to be diseases which are caused by special organisms, still we may not yet say that now *all* contagia or even all infectious diseases are caused by living organisms. After it has appeared that a doctrine, which was formulated already in the sixteenth century, and which has since obstinately emerged again and again in the ideas of men, has at last, since the second decade of the present century, obtained more and more positive proofs for its correctness, we might really think that now it was our duty to infer, in the sense of an inductive extension of our knowledge, that all contagia and miasmata are living organisms. Indeed, gentlemen, I will admit that this conception is an extremely probable one. Even those investigators, who have not yet gone so far as to regard the contagia and miasmata as living beings have yet always said that they resemble living beings very closely, that they have properties which we otherwise know in living beings only, that they propagate their kind, that they increase

¹ Address delivered at the Munich meeting of the German Association, by Prof. Rudolf Virchow, of Berlin. Continued from p. 74.